An Overview of the NASA Electronic, Electrical, and Electromechanical Parts Information Management System (EPIMS)

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ABSTRACT

The Electrical, Electronic, and Electromechanical (EEE) Parts Information Management System (*EPIMS*) is a comprehensive data system, called to support the management of EEE parts for all NASA projects. EPIMS 1.0 became operational in February of 1994, and implements a core set of functions. EPIMS 2.0 was released in March of 2000, and introduced file upload and parts list check-in, among other features.

Keywords: components, database, electronics, parts, PDM.

1.0 PURPOSE AND SCOPE

The purpose of EPIMS is to provide automated engineering information management for EEE parts reliability, quality assurance, design support, and cost control with an agency-wide, integrated, on-line data system accessible to all NASA projects, contractors, and supporting personnel.

The scope of EPIMS includes storage of and access to EEE part selection, availability, qualification, usage, test, field history, and inventory data; electronic submittal of contractual data requirements; and automated support for parts management tasks for all NASA projects and for the NASA Electronic Parts and Packaging (*NEPP*) Program.

2.0 OBJECTIVES

EPIMS is an information resource designed to be accessible to all NASA Centers, projects, and cooperating activities. The system objectives are to provide:

- sharing of parts and design data among all NASA projects;
- agency-wide coordination of EEE parts management activities;
- electronic capture of data, enabling
  - elimination of duplicate data entry and
  - minimization and eventual elimination of paper systems;
- a knowledge base of parts technical expertise;
- integration of NASA EEE parts management with system design activities.

3.0 POLICIES AND STANDARDS

The policies or standards relevant to EPIMS include both domain standards and policies (NASA EEE parts policies) and metadata standards (system and software standards).

3.1 EEE Parts Domain

All policy documents are cited in Section 2, Reference Documentation. EPIMS is designed to support the Data Item Descriptions (DID's) specified in the Electrical, Electronic, and Electromechanical (EEE) Parts Management and Control Requirements for NASA Space Flight Programs, NHB 5300.4(1F) (July 1989), which defines the NASA requirements for EEE parts management and control for NASA spaceflight projects.

3.2 System, Software, and Metadata Standards

The system, software, and metadata standards applicable to EPIMS are:

- The POSIX (IEEE 1003.1, FIPS 151-1) operating system standard (a NIST Application Portability Profile standard);
- ISO 8879, the Standard Generalized Mark-up Language (SGML);
- IEC Draft International Standard 1360-1, "Principles and Methods for Defining Standard Data Element Types with Associated Classification Scheme for Electric Components;"
- ISO 10303, or "STEP", "Product Data Representation and Exchange," an international standard for the exchange of product life cycle data.

POSIX and STEP are integral to the EPIMS concept. The EPIMS server runs on a POSIX-compliant Operating System (Solaris) and utilizes POSIX standard scripting languages in implementing EPIMS application modules. Input formats, output formats, and a repository structure based on the ISO 10303 (STEP) standard will be incorporated in future releases of EPIMS.

4.0 USER COMMUNITY DEFINITION

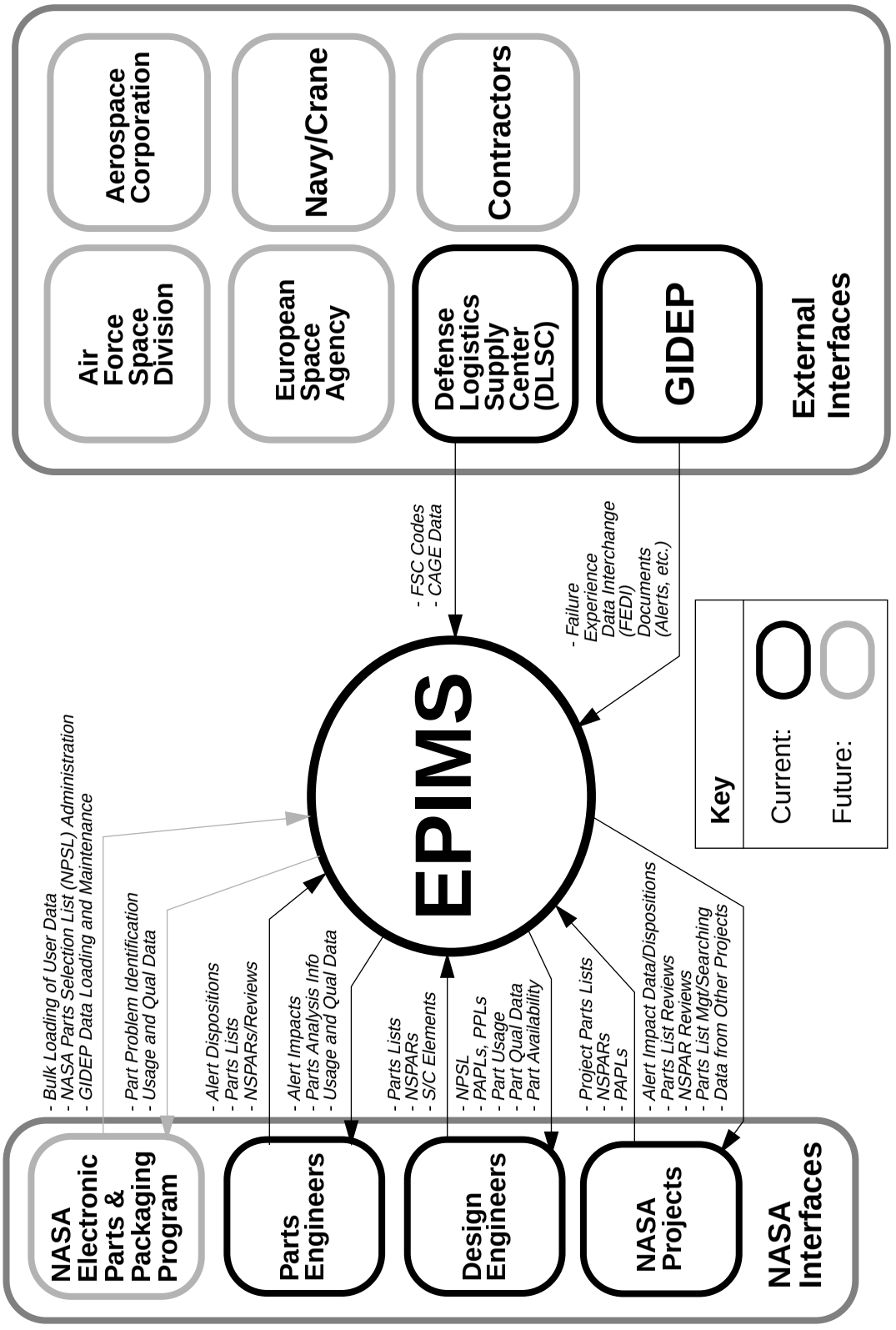
4.1 Primary Users

- All NASA and JPL project parts engineers and design engineers
- The NASA Electronic Parts and Packaging Program (NEPP) managers, engineers, and support contractors
- Any other NASA and NASA support contractor personnel, NASA partners, and co-investigators who need EEE parts data

4.2 Secondary Users

- NASA OEM's: Boeing, Lockheed-Martin, Ball Aerospace, Hughes, etc.
- DoD: Navy-CRANE, Air Force Space Systems Division

5.0 INTERFACES AND DATA FLOWS



6.0 SYSTEM ARCHITECTURE

6.1 Concept: Design Intent of EPIMS

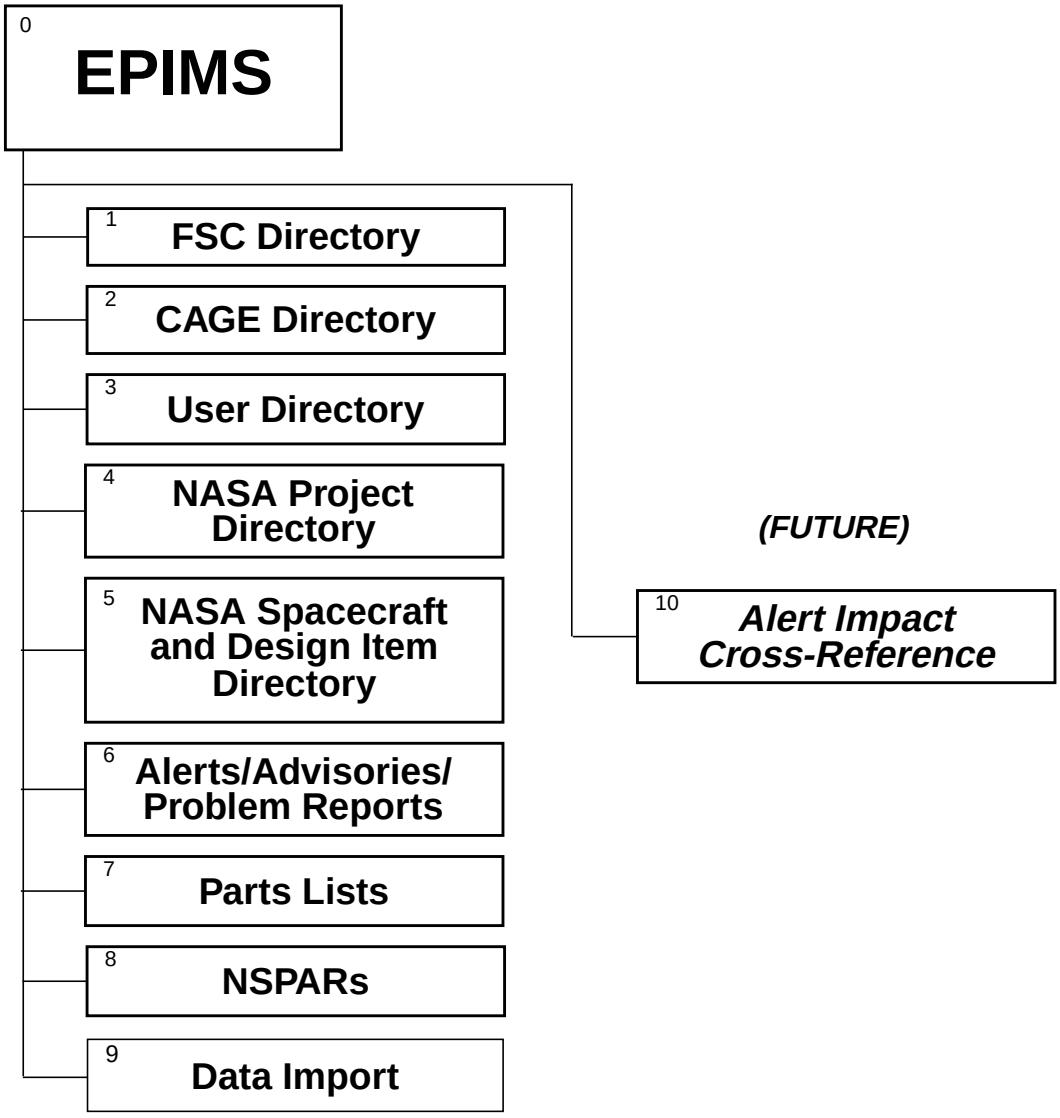
The intent of EPIMS is to provide a repository for EEE parts data that will enable a tighter coupling between the activities of EEE parts engineers and NASA designers. Quick access to current data is essential to enable the parts engineers to support designers on the part selection and qualification issues that arise early in the formulation of designs for flight hardware.

The goal of EPIMS will provide "one-stop shopping" for the management of project EEE parts information for NASA designers, parts engineers, and project personnel, and to integrate that information with reference data and documents (e.g., the data maintained by the NEPP program) and other project data, such as drawings, design models, and project documents.

6.2 Implementation: Web Client / Server with CGI Database Interface

The system architecture concept for EPIMS is based on a simple Web client-server structure. The EPIMS application consists of a database, interface applications, and a Web server. All data is served to the user by way of the user's Web browser, using context-sensitive, active HTML pages. Users connect to EPIMS by logging on to the EPIMS Web server via Basic Authentication (userid/password) and access the EPIMS database via CGI applications with script-generated HTML forms interfaces.

7.0 FUNCTIONAL DECOMPOSITION



8.0 SYNOPSIS OF FUNCTIONS

1. **Federal Supply Class (FSC) Directory**
   - Complete FSC database (all FSC's used by Defense Logistics Agency)
   - FSC pop-up list from within other functions for selection of valid FSC's for use in search criteria
2. **Commercial And Government Entity (CAGE) Directory**
   - Complete CAGE database (over 750,000 organization locations), updated quarterly by download from the Defense Logistics Support Command (*DLSC*)
   - Query by CAGE number, name; wild-card search on names or on all fields
   - CAGE directory access from other functions for quick look-up and insert
   - Reports, with view, print, and save-to-file capabilities
3. **User Directory and Data Access Control**
   - Complete EPIMS user directory -- data is obtained from NASA's X.500 directory for NASA and NASA contractor personnel who are listed there
   - Associates each user with an organization (CAGE), project(s), and access role(s)
4. **NASA Project Directory**
   - Directory of all projects with data in EPIMS
   - Project pop-up from other functions for valid project acronyms to use in searches
5. **NASA Spacecraft and Design Elements Directory**
   - Database of all spacecraft and design items in EPIMS
   - Spacecraft/design element search by attributes, drill-down to parts lists
   - Spacecraft and design element metadata maintenance function for Project Data Administrators
6. **Alerts/Advisories/Problem Reports**
   - EPIMS provides access to the NASA Alert Reporting System (NARS), a database of all GIDEP FEDI documents (Alerts, Safe-Alerts, Problem Advisories, etc.) and NASA Advisories
   - Query by Alert number, part number, FSC, CAGE code, full-text search on all document text and attributes, searches by date (before, after, between two dates)
   - Reports, with view, print, and save-to-file capabilities
7. **Parts Lists**
   - Repository support for all project parts lists (Project-Approved, Early-Potential, As-Designed, As-Built, and Inventory Lists)
   - Search for parts lists by spacecraft or design item; wild-card search
   - Search for "part usage" (usages of parts in EPIMS parts lists) by project, part number, FSC, CAGE code, or all fields
   - "Where-used" report showing where a part is used by parts list, design item, and project, with pop-up windows for specific data on parts lists, design items, projects, CAGE codes, and parts list points of contact
   - Parts list data maintenance functions assigned by Project Data Administrator
   - Separate versioning for each parts list type (i.e., PAPL, EPPL, ADPL, ABPL, etc.) associated with a given design item
   - Reports, with view, print, and save-to-file capabilities
8. **Non-Standard Part Approval Requests (NSPAR)**
   - Repository support for all project NSPAR's
   - Query by part number, FSC, CAGE code, spacecraft or design element number, name, etc.; wild-card search
   - NSPAR maintenance functions assigned by Project Data Administrator

- Support for multiple versions and submittals
- Reports, with view, print, and save-to-file capabilities

9. Data Import

- Upload of parts list file (in tab-separated-values format) via Web browser
- Mapping function enabling user to specify how the part attribute columns used in their parts list map to the EPIMS part attributes
- Automated transformation of parts list data via the user-specified maps
- Saving of maps for re-use in future parts list check-ins
- Capability to specify the design item to which a parts list applies either by selecting a pre-defined design item in EPIMS or by defining a new item and associated attribute data
- Email notification when parts list check-in process completes

9.0 PLANNED FUNCTIONS

10. Alert Impact Cross-Reference

- Automated cross-referencing of Alerts (all GIDEP FEDI data and NASA Advisories) to all project parts lists and NSPAR's in EPIMS — matching done by part number, FSC, and CAGE
- Cross-reference automatically updated whenever new Alerts, etc., are added; also whenever a parts list or NSPAR is added or modified
- Query by part number, FSC, CAGE code, spacecraft or design element number, name, etc.; wild-card search
- Automatic email notification to project users when new Alert impacts to project parts lists are identified by automated cross-referencing
- Closed loop system for Alert impact dispositioning
- Reports, with view, print, and save-to-file capabilities

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